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ABSTRACT

This consolidation study concentrates on major questions about effectiveness of online delivery of education and training in Australia through the literature that describes effects of these new forms of delivery on the learner/user and provider/practitioner. Chapter 1 focuses on sources of data used in the literature review, defines online delivery, and reports on existing evaluations. Chapter 2 looks at forms of online delivery of education and training. Chapter 3 concentrates on literature relating to the pedagogy of online learning, learning styles of online learners, and user skills. The teaching/learning issues include the emergence of a web pedagogy, student learning styles, and levels of user skills. Chapter 4 focuses on studies about improved student outcomes online. It reports on quantitative and qualitative measures of improvement and lists preconditions that will contribute to effective online learning. Chapter 5 discusses different measures of the effectiveness of online delivery. It looks at the concept of effectiveness from the perspective of the education or training organization, teacher/trainer, industry policy maker, and individual learner. Chapter 6 examines implications of online delivery for instructional design, curriculum design, and teachers and learners in a constructivist online environment. Chapters 7-8 offer findings and directions for further research. (Contains 81 references.) (YLB)

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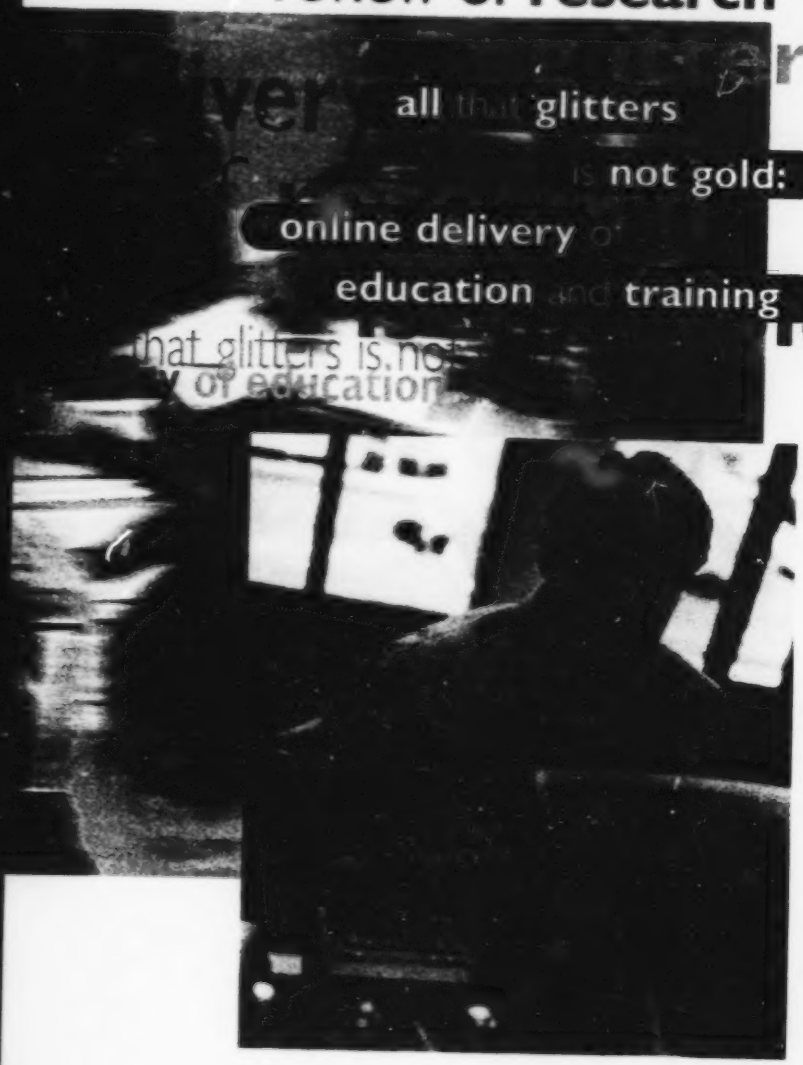
NCVER

review of research

all that glitters is not gold: online delivery of education and training



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executive summary

Online delivery is a significant educational innovation. Like the telephone, the car and the television, there are very different views about its potential, its future and its impact on education and training in Australia. As with any innovation the opinions, ideas and research which surround it are often contradictory and more ideological than empirical. We are surrounded by hyperbole, beguiled by the prophecies of future possibilities and upset by some of our own experiences. Getting the 'here and now' right is an issue which is lost in this obfuscation.

The new technologies represent challenges to the traditional ways of delivering education and training. Firstly, there is the potential loss of work if the scenario of teacherless classrooms comes anywhere near reality. Secondly, technology, by its very existence and its degree of present and predicted permeation of education and training, throws all existing methods up to scrutiny. Practitioners are forced to examine and justify their existences. This 'forced reflection' is an uncomfortable status for both individuals and systems. Some see technology as being definitely not in their interest for both these reasons. It is also true that the new technologies require lots of 'new learning' as teachers and trainers come to terms with the pedagogy and the technical prowess demanded by delivering and supporting online learners.

This consolidation study concentrates on the major questions about the effectiveness of online delivery of education and training in Australia. These include questions about:

- improved student outcomes
- impacts on teachers and learners, beneficiaries and casualties
- teacher/trainer preparation
- pedagogy
- materials design
- learner diversity

The study focusses on the areas of contention. These then provide guideposts for further research and thought. The research directions identified in this report should be used to inform policy decisions.

From a review of literature it was established that the following set of preconditions is necessary if the main goal of improved learning outcomes for students/users in an online environment is to be achieved. Student/user needs will be met if we:

- acknowledge and take into account differences in student/user backgrounds in every phase of the design and delivery of online materials and support
- strenuously apply the lessons we have already learnt about good teaching and learning
- cater for the differences in learning styles and preferences of student/users
- accept that student technological skill and comfort is located along a continuum of proficiency and plan to accept these and design materials and environments accordingly
- recognise that there are huge differentials in access to the new technologies and work towards reducing these
- evaluate the effectiveness of online programs using a variety of methodologies and time frames
- prepare teachers/trainers to use new technologies flexibly and beyond minimum levels of competence
- seek to explicitly enhance information literacy skills
- focus on the communicative and interactive dimensions of the new environments
- don't expect technology to solve all the hard problems

introduction

This chapter focusses on the sources of data used in the review of literature, provides a definition of online delivery and reports on a number of existing evaluations.

summary

> *Implementation of technology is a tricky business. It requires an act of faith on the part of the institution, a step into the unknown and has to be seen as an experimental and exploratory process informed by continual evaluation.*
>
> (Rice 1997, p.4)

In the last decade the changes in the Australian vocational education and training (VET) sector and the accompanying changes in the delivery of education and training have coincided with rapid developments in technology. There is a need to stop, catch our breath, and take a look at where we are and then thoughtfully use this knowledge to plan our future. This consolidation study is an evaluation of the effectiveness on online delivery of education and training in Australia. Evaluation is a question that has not been taken on in a concerted way in spite of the huge claims made about the future effectiveness of online delivery and its intemperate appetite for time, money and resources. Therefore, the study subdivides the topic of the evaluation of online delivery of education and training into smaller, more manageable topics and questions that, when addressed by the literature, will give a composite picture of this subject.

In the last decade the changes in the Australian vocational education and training (VET) sector and the accompanying changes in the delivery of education and training have coincided with rapid developments in technology.

For these reasons, this consolidation study:

- provides a 'stocktake' of the literature, discourses and current practice related to online delivery of education and training in Australia
- maps the areas of tension and disagreement in the discussions about online delivery of education and training

- analyses the developing frameworks for the evaluation of 'effective' online delivery of education and training
- creates a discussion framework that provides insights into the further research, debate and policy formulation that are needed in this area

To achieve these objectives we have:

- collected information on the forms of online delivery of education and training in business, education and training organisations
- surveyed the literature and web-based information. Services used include the Australian Education Index, ERIC and the Australian-based search engines Anzwers and WEBwombat. We have followed links from providers of education and training; monitored Listservs and their archived materials; explored the sites provided by industry training accreditation boards; tapped into the resources of the Educational Network Australia (EdNA), the National Centre for Vocational Education Research (NCVER) and the Australian National Training Authority (ANTA) and followed bibliographical references
- assessed the literature to identify a coherent core of web pedagogy that underpins online delivery of education and training in Australia
- mapped the extent to which the literature identifies the contribution of online delivery to improved student outcomes
- identified the measures of 'effectiveness' applied to online delivery of education and training and identified who benefits, who does not, why and how
- placed concepts of different learning styles beside methods of online delivery
- charted some of the impacts of online delivery on teaching styles and described some of the theories of knowledge and their association with online delivery, especially constructivism
- plotted the gaps between traditional instructional educational design and online design of learning materials
- identified the continuum of online delivery of education and training needed to cater for entry-level users through to proficient users
- discussed appropriate content for online delivery
- created the space for critical analysis

background

Online delivery of education and training in Australia is located in a globalised world economy where, for example, one individual can generate a gross income from the sale of the new technologies that exceeds the gross domestic product of a number of individual nations. This company has no land, no geography, no long history, no culture, and no government structure. It is the archetype of the 'new information economy'.

There is an apparent global explosion of online learning, products and technologies. For example, America's Learning Exchange expected to have one million courses on its books in 1999. It is estimated that there are three million cyber students in the United States. Canada presently lists 12 000 online courses. There are also some moves to create partnerships between educational providers to create common learning environments.

Online delivery of education and training in Australia is located in a globalised world economy.

Globally there is a glut of advertised formal and informal opportunities for learners to take up education and training using the new technologies. This activity is occurring progressively outside the precincts of the traditional providers. It has become big business. The chance to learn everything from Latin to food processing online has freed up the educational marketplace in quite radical ways (owner-cae-ozace@lists.vicnet.net.au, 21/01/00).

This study looks at a tiny sliver of the bigger global picture where sometimes the only evaluation of effectiveness is the return on dollars invested. The billion dollar budgets of global enterprises and the extent of their market penetration places traditional providers of education and training in some difficult spaces. The lines between public and private provision and formal and informal education and training are blurring.

rationale of research

This study looks specifically at the debates within the literature about the effectiveness of online delivery of education and training in Australia, whilst acknowledging the environment of global commercial expansion in online technologies. It concentrates on the literature that describes the effects of these new forms of delivery on the learner/user and the provider/practitioner.

The application of new technologies to the education and VET sectors are exemplified by the changing relationships between:

- teachers and students
- trainers and participants
- content and delivery
- knowledge and institutions

These rapid changes have:

- almost eliminated time and space as barriers to some forms of communication
- allowed information to be updated and added to in micro seconds
- put people in touch with one another as they develop courses, create packages, teach subjects and undertake training and study
- reconfigured relationships between all the partners in the learning equation

There is an impressive amount of digital and hard copy literature on the topic of online delivery of education and training in Australia, and some valuable pieces of analysis from overseas. This evaluation brings to light:

- articles in reputable education, training and information technology (IT) journals
- a proliferation of online Listservs patronised by a range of people from all over the globe
- books
- web sites
- a range of popular and accessible materials designed for mass audiences

There is also a great deal of public discussion of the topic taking place in all forms of the media and it is sometimes difficult to distinguish between 'reporting' and 'advertising'.

definition of online delivery

It is clear from the literature reviewed for this study that there is a lack of rigour about the definitional base which underpins the term 'online delivery'. It can be as broad or as narrow as the predispositions of each author. Some writers include everything that has anything to do with a computer, whilst others restrict their

analysis and writing to specifically designed programs and communications that have to do with education and training (Booker 2000). For the purposes of this study we have adopted the University of Illinois (1999) definition that identifies three broad categories of online delivery:

- where computers support teaching and learning
- where there is a mixture of computer support and online delivery
- where computer technology alone delivers education and training

There is a lack of rigour about the definitional base which underpins the term 'online delivery'.

In summary, we are looking at computer technology which enhances, extends and replaces traditional teaching and training practices.

The new educational tools that use the computer as their platform include digital video disk, WEB TV, voice recognition systems, video and voice synthesis, streaming audio and video, email, chat and MOO (multi-object orientation) and MUD (multi-user dungeon) environments, CD ROM, voice translation, intelligent agents and the extensive use of the internet.

sources of data

The analysis of the literature and its particular 'research bases' will help inform policy-makers, researchers, providers and practitioners by offering an audit of the current situation and by identifying possibilities for the future.

The literature cited in this study is the result of extensive database searches that have been completed through the Charles Sturt University Library. Internet search engines have also been used. It is interesting to note that when the descriptors 'online', 'delivery', 'vocational education and training' are combined with the descriptor 'evaluation', the number of citations is restricted. This confirms the 1998 findings of Dillon and Gabbard in the *Review of educational research*.

However, a number of very detailed literature reviews have been completed on a range of associated topics. These have been used in this study. The extensive literature search completed by Saunders and Archee (1999) as part of their investigation into flexible delivery produced a review of 361 references which they then categorised according to six main themes that have relevance to this study. The results of this review of literature are incorporated into this report. Dillon and Gabbard (1998) have surveyed the empirical literature on the 'quantitative effects of hypertext/hypermedia on learning outcome'.

Ikegulu and Ikegulu (1999) have completed a review of the research studies carried out in the last five years into the 'window presentation strategies and the cognitive dependence status of field-dependent/independent learners in a computer mediated instruction'. Abdullah (1999) analysed the literature in terms of the ways the new technologies are being used to enhance communication between teachers/facilitators and students/participants. McKavanagh et al. (1999a, 1999b), Booker (2000) and Harper et al. (2000) also included the results of their literature searches in their recent publications. These reviews have contributed a sense of confidence in tackling the multi-dimensional nature of 'evaluation' by providing some synthesised and credible snapshots of the work that is being done in this area.

It is clear from the work completed and the research methodology that generates the information that the literature falls into a number of categories. These text types include material that:

- is written to provide an accountability for the funds expended on technology. This tends to be unequivocal, uncritical and cast always in terms of what technology 'will do', not 'does do'. It is future oriented, expansive and panoramic in its claims (Research Forum 2000; Marquardt & Kearsley 1999)
- takes specific aspects on online delivery of education and training and examines them in detail for appropriateness, practicality and utility (Davies & Mendenhall 1998; Ikegulu & Ikegulu 1999)
- attempts to place technology within a broader pedagogical context (Alexander & McKenzie 1998; Kilpatrick 1997)
- relates technology to learning and thinking styles (Betz 2000; Brown 1998; Jasinski 1998)
- focusses on design and delivery (Carlson et al. 1998; Cochenour & Reynolds 1998; Zorfass, Remz & Gold 1998)
- examines the capacity on online services to provide assessment in education and training (Kerka 2000; Lee 1999)
- focusses on learning theory (Edwards & Fritz 1999; Warner & Choy 2000)
- stresses the equity implications both good and bad (Chomsky 1999; Cope & Kalantzis 1998; Else & Hicks 1998; Gladieux & Swail 1999)
- describes and investigates the communicative benefits of online delivery (Bull et al. 1999; Laurillard 1993)
- blurs the lines between advertising and reputable information (Masie 2000)

There is no shortage of 'popular' electronic and print-based literature on the subject of online learning in education and training. Electronic lists are awash with snappy tasters of conferences and conventions that market themselves under brand names that frequently have the word 'learn' included in their banners. This cyber advertising is quick and full of the future-tense needs of workers and business. Education and learning are marketed as giving you and your business the competitive edge. The tone is sometimes imperious and rhetorical. The texts resonate with definitive statements designed to give us technological comfort in a period of remarkable uncertainty.

There is no shortage of 'popular' electronic and print-based literature on the subject of online learning in education and training.

We have a body of popular literature that ignores the collision between technology and older views of teaching and learning.

> *We have a ... welter of information and interpretation, fact and fiction, pessimism and optimism but the discursive field as a whole has been dominated by discourses steeped in unreflective technological instrumentalism and utopianism. While other perspectives are available, these have been subordinate, and often difficult to access and put in context.*
>
> (Bigum & Kenway 1998, p.2)

Pedagogy, instructional design, assessment and evaluation, the social and volitional dimensions of learning all occupy places within the research. Linguists are involved, as are people with an interest in literature, narrative and scenario building. There is quantitative data available and the field is highly contested. Bringing together the literature from all these sources is a difficult task.

evaluation of online delivery

> *Online evaluation is inherently difficult and published results are ambiguous and scant.* (University of Illinois 1999, p.5)

The specific literature relating to evaluation that has been surveyed uses various methods for judging the effectiveness of online delivery of education and training. For example, the Bennett, Priest and McPherson (1999) study used questionnaires and case studies. Laurillard (1993) used 'conversation theory' to analyse the kinds of learning exchanges which take place in the online learning environments. If the learning is to be effective then four major categories of conversational relationships need to be present. McKavanagh et al. (1999a) have

been researching the degree to which this conceptual framework supports information collected using survey instruments and case studies. There has also been work done on the linguistic framework that surrounds computer mediated conversation and a consequent analysis of the types of learning that take place.

Bigum and Kenway (1998) have developed a set of 'camps' to contextualise and make sense of the polarised and different debates about the use of technology in schools, and by implication within the VET sector:

> *We have divided it (the field) into four 'ideal types' which we have called the Boosters, Anti-Schoolers, Critics and Doomsters. We acknowledge that there is some overlap between these types, that individual authors cross the borders at times and that some modes of analysis do not easily fit into these frames—we are looking at tendencies only. Nonetheless, we feel that because of the information glut about new information media, a mapping exercise is necessary. It is worth noting here that while each set of ideas has its own internal dialogue, there is far too little debate across the groups. While no group gives the other's ideas much credence, the Boosters and the Anti-Schoolers express little or no interest in the views of the Critics and Doomsters who do at least engage the work of their counterparts—if only to demolish it. The dominant voices in schools as in society generally are those of the Boosters, proponents, sellers, early adopters, those fascinated with the technology, and those who are wedded to a particular view of technological progress. But it is important to hear other voices and attend to their concerns.*
>
> (Bigum & Kenway 1998)

Some studies have applied the tools of linguistics to records of online interactions to establish the type and depth of learning that is taking place (McKavanagh et al. 1999b; Sims 1999). Other studies have relied heavily on anecdotal evidence collected from participants, designers and facilitators (Saunders & Archee 1999; Rice 1997).

The evaluations conducted by Bennett, Priest and McPherson (1999), Bigum and Kenway (1998, p.3), Brennan (2000), Laurillard (1993) and McKavanagh et al. (1999a) have some common findings. These include:

- students wanted contact with each other and their teachers
- students learnt about the technology, the information and the topic provided that the online activities were stimulating when well designed
- there was frustration at times with the limitations of the technology and its random behaviour
- online participation can be time consuming sometimes for students and teachers

- the medium provided some insights into the problems faced by others
- the time to download information and activities was sometimes a draw back
- individual learners need to be have well-developed information literacy skills
- new styles of communication are not always capitalised on by teachers and facilitators
- the new media can encourage more independent and 'deep engagement' in the learning process (Bennett, Priest & McPherson 1999; McKavanagh et al. 1999a, 1999b)

A study carried out by Brennan (2000) juxtaposed information from:

- the literature
- interviews with policy-makers and practitioners, educational designers and students
- case studies
- web-based distribution lists
- a survey of students and staff using online support for their teaching and learning

The Engestrom Framework (Engestrom 1999) was then applied to help describe the conflicting attitudes and ideas that the individuals in this study had about online delivery of education and training. The framework provides a model for graphically representing disparities in debate. It helps to identify the areas of contention and contradiction and shows how these can be resolved by new forms of connection, communication and learning. The data gathered showed that participants in the activity of online teaching and learning are separated by gulfs of knowledge and skill, and conversations that might lead to resolution are limited.

impacts of online delivery

The study described above (Brennan 2000) indicated that the present impacts of online delivery are very different from the various groups involved. There are few bridges between the online experiences of teachers, students, designers and policy-makers. In many cases, the experimental differences mitigate against improved outcomes for students.

This situation can be explained by the fact that new tools are never neutral. They impact with a force that is sometimes not acknowledged at the point of their

creation or introduction. The sometimes raw edges of the 'strategy and implementation model' are abrasive for the practitioners involved. The new technologies make for new ways of doing, being, working, seeing, responding and thinking. These changes and their ripples need far greater levels of institutional and professional support and evaluation if they are to deliver one-tenth of the promised educational and training advantages. The speed of change and the constant renegotiation of the working environment online puts pressures on staff and students which rarely appear in the official documentation of progress. The past experiences of 'educational evolution' seem to have been overtaken by developments that often feel much more like imposition than progress (Brennan 2000).

focus on delivery

This chapter looks at the forms of online delivery of education and training in Australia.

the **Australian context**

The Australian Bureau of Statistics (ABS) survey of February 1998 into internet usage in Australia, reported by Bill Pattinson and Joseph Di Gregorio (1998), gives a limited indication of the penetration and use of the new technologies in education and training. According to the ABS data there are three million internet users in Australia and approximately one-third of these use the internet for information searching related to their formal studies. Eighty per cent of those people undertaking study over the age of 18 years of age have accessed the internet as part of their courses of study. The internet users were strongly concentrated in the 18 to 24-year age bracket (43%) and in the 25 to 39-year age bracket (37%).

It is very hard to find any accurate data on the extent of online delivery of education and training in Australia, and the data that are available are sometimes confusing and contradictory.

It is very hard to find any accurate data on the extent of online delivery of education and training in Australia, and the data that are available are sometimes confusing and contradictory. The ABS has no firm statistics apart from those reported by Pattinson and Di Gregorio (1998). NCVER is in a similar position. Lists of online courses are provided by institutions, but there is little accurate information about the extent to which they are being used, by whom and in what ways (Pattison & Di Gregorio 1998).

The study by McKavanagh et al. (1999a) concluded at that time that: 'In line with predictions and despite the intense interest in planning for online delivery, only a small number of VET modules are actually currently on offer in Australia'. This has been supported by information collected in rural New South Wales (Brennan 2000).

Harper et al. (2000) provide another set of statistics that highlights the dispersed nature of online delivery. Their data was collected by assessing major initiatives where there was a strong focus of both effort and resources:

> *For example, in South Australia, TAFE has an estimated 5000 students participating in online learning, with approximately 30% studying completely off campus. Victoria's TAFE Virtual Campus had approximately 1600 students enrolled in September 1999; however, this number does not include students enrolled in subjects delivered partly online.* (Harper et al. 2000, p.9)

However, public and private providers of education and training, public instrumentalities, universities and industry are investing large amounts of money in providing the infrastructure to make this type of delivery happen. A recent publication from the Australian Vocational Education and Training Development List (trdev-aus, 16/12/99) itemises 'some examples of training courses which use World Wide Web pages for the whole or a part of their delivery'. The 28 sites listed include large organisations who are offering a range of courses (for example, WestOne), TAFE institutes across Australia via a virtual campus system (Victorian TAFE Virtual Campus), joint university and TAFE provisions (online delivery at Swinburne University–TAFE Division), ANTA initiatives and private providers (Qantas College Online and TechWorks Learning System).

Courses and materials are delivered online but there is very little research into the quality of the learning taking place.

Universities are offering online support within existing course offerings and some fully online courses. The Royal Melbourne Institute of Technology courses in computing and IT are typical of the fully online provisions. Schools across Australia are using the internet in classrooms and taking advantage of the accompanying search and communication capacities. Business increasingly uses the internet for communication, information and its management, and problem solving (Natesan & Smith 1998 in Bennett, Priest & McPherson 1999).

The problems associated with getting a snapshot of the extent of online delivery, therefore, have a lot to do with the very different definitions of the term 'online' that are being used almost interchangeably, and the fact that the permutations of usage change with remarkable speed (Edwards & Fritz 1999).

Counting courses and participants and then using these data as a measure of the take-up rates of technology in education and training is always going to be a

flawed activity. A clear distinction also needs to be made between delivery and learning. Courses and materials are delivered online but there is very little research into the quality of the learning taking place. Tinkler, Lepani and Mitchell (1996) have taken a more practical view of the context and reported on their analysis on the online environments being used for education and training. Their report, commissioned on behalf of the National Board of Employment, Education and Training and published in 1996, is an extensive piece of work that provides a coherent mapping of these online environments.

forms of **online delivery** in Australia

informal offerings

There is a variety of informal offerings of online education and training in Australia, and they are frequently credentialled outside the 'official' frameworks. A quick trawl through the internet hints that, in the cyber marketplace, there are:

- a growing range of private companies offering certificated courses (some with transferable and acceptable credentials and some without)
- learning networks of teachers/facilitators and students/participants blossoming and connecting
- multinationals like the Ericsson company delivering online training to workers right across the globe
- examples of online coaching for kids, an amazing array of courses and learning activities for all ages
- capacities to design our own online courses using sites such as 'Blackboard.com'

formal offerings by traditional providers

The traditional providers of education and training in Australia are using the new technologies both for communication and some formal delivery. 'Most TAFE systems and many private providers are offering courses on line and there is significant reporting of developments and outcomes in literature and at conferences such as Networking99 and earlier Networking97' (Booker 2000, p.7).

Adult and community education (ACE) is putting some or parts of its courses online. Universities, schools and TAFE providers are adjusting to the new environment and providing varying degrees of online support and direct delivery to learners within their courses. Some are delivering whole courses online. Industry is

beginning to take advantage of the opportunities that are both commercially and publicly available.

The types of formal delivery include:

- a mixture of online and face-to-face
- a mixture of online and print-based distance education materials
- total online delivery

In spite of the variety of offerings, the proliferation of access to the internet and increasing patterns of usage (ABS 1998), the formal, officially credentialled number of online offerings by schools, universities, TAFE and industry still remains relatively small. A lot of the education and training 'transactions' are taking place using the new technologies, with forms such as email providing quick and easy access between teachers and students. However, the technologies are being used for searching, for communicating, for providing information, and for processing text in various forms—not for full online delivery (Booker 2000).

In spite of the variety of offerings, the proliferation of access to the internet and increasing patterns of usage, the formal, officially credentialled number of online offerings by schools, universities, TAFE and industry still remains relatively small.

The study by McKavanagh et al. (1999a, 1999b) confirms this profile. The study began with a scoping exercise to establish the extent and forms of online delivery of VET in Australia in both public and private sectors. The recency of this study and its results deserve attention. The methodology of the scoping exercise is as follows:

A database on online VET providers in Australia was established through networking with the EdNA, VET representatives from each State, staff from the Australian National Training Authority (ANTA), as well as formal and informal networks comprising VET teachers and trainers. Invitations to participate were widely published in VET newsletters and electronic postings. Searches were also conducted via the internet to identify other online VET providers.

Every attempt has been made to be inclusive, and while there are a great many plans to implement more online flexible learning, there were surprisingly few modules with actual enrolments during the survey period (McKavanagh et al. 1999a, p.3).

As a result of this rigorous sampling, the researchers found that:

- a lot of the delivery was not yet online, although there were a lot of plans
- most online modules had a nominal duration of 40 hours
- the number of enrolments reported for the 73 valid cases from 12 different providers varied from six to 144, with a median value of 31, again indicating the small present scale implementation of online learning in VET (McKavanagh et al. 1999a)

> *In line with predictions and despite intense interest in planning for online delivery, only a small number of VET modules are actually currently on offer in Australia.* (McKavanagh et al. 1999a, p.10)

These findings are supported by the study undertaken by Misko (2000). She says:

> *Online delivery of instruction is still in its formative stages in Australian TAFE colleges. Early indicators are that it is an effective method of delivery of introductory courses for students who have some basic familiarity with computer skills and who have the motivation and ability to work independently.* (Misko 2000, p.12)

There are reports of some innovative programs using a mixture of technologies. The satellite delivery by the Open Training and Education Network (OTEN) of ten satellite broadcasts followed by fax and telephone contact has brought parts of the Associate Diploma in Business to students (Dobbs 1996). TAFE South Australia uses the internet and the web to deliver courses and services (Strong 2000). There is also research taking place into the role of libraries in the support of online delivery of VET and education (Murphy 2000).

Frankhauser and Lopaczuk (1996) report on the growing number of partnerships between industry and TAFE to deliver workplace training 'often using computer assisted learning modes as the instructional design and delivery format'. In this context the design of the materials is very focussed on vocational outcomes which have 'occupational relevance' (Frankhauser & Lopaczuk 1996). In the commercial world:

> *Computer-based learning is sometimes adopted to train staff in workplaces. It has been used for the training of word processor operators, clerks in industries like banks and insurance companies. In many cases, however, it has been shown that if this way of learning is not fully integrated into the culture of the organisation it will not be effective.* (Misko 2000, p.10)

focus on teaching and learning issues

This chapter concentrates on the literature that relates to the pedagogy of online learning, the learning styles of online learners and user skills.

overview

The teaching and learning issues associated with online delivery of education and training include the emergence of a web pedagogy, student learning styles and levels of user skills. These issues contribute to any judgement about the effectiveness of online delivery of education and training.

The new technologies certainly have the potential to generate new processes of teaching and learning, but so few of the possibilities have yet to be recognised.

pedagogy

For the purposes of this study, 'pedagogy' is defined as a core of effective and traditional practices of teaching and training that have worked over time. Pedagogies are embedded in programs and practices as assumptions that influence the design and delivery of teaching and training.

The new technologies certainly have the potential to generate new processes of teaching and learning, but so few of the possibilities have yet to be recognised (Jasinski 1998; McKavanagh et al. 1999a). In the enthusiasm for the technology, the hard questions about teaching and learning have often been overlooked. Technology seems to be driving pedagogy (Jasinski 1998; Knupfer 1993), and there is a shortage of literature that addresses the specific issue of a coherent web pedagogy. The medium is relatively new, and the passion for the transmission of learning, rather than the transaction or transformation of the process, is difficult to question.

The reluctance to address pedagogical issues is also explicable in terms of 'practitioner risk'. The traditional top-down methods of delivery characteristic of distance education, some of the recent flexible delivery practices, and the highly regulated lock-step nature of some online training programs are being shown to be ineffective in improving student learning outcomes (see chapter 'Outcomes'). In some cases the education and training programs are even detrimental to student progress (Sims 1999). In all settings the technology is forcing teachers and trainers to ask some hard questions about the effectiveness of established pedagogy even within traditional classroom settings (Research Forum 2000).

> *The picture that emerges is that the technology and arrangements for flexible learning is being used to extend traditional teacher-centred approaches to off-campus learners, rather than providing for new approaches to teaching and learning. Nevertheless, independent student engagement, more linked to adult-learning principles than to traditional classroom methods of learning, was also occurring.* (McKavanagh et al. 1999b, p.18)

Therefore, discussions are starting to emerge (Sims 1999; McKavanagh et al. 1999a; Jasinski 1998), but for the most part the pedagogy of online delivery of education and training remains buried implicitly in the design and delivery of materials online.

studies on online pedagogy

Two major studies of the pedagogy of online delivery of education and training, one from Australia and one from the United States, look at the multidimensional nature of pedagogy. The first study involved about 80 VET practitioners, an online survey, three web forums and interviews. The author, Marie Jasinski (1998), investigated issues relating to pedagogy online, with a particular focus on identifying teaching and learning styles that facilitate online learning. The study produced the following findings:

> *Technology does not cause learning. As an instructional medium online technologies will not in themselves improve or cause changes in learning. What improves learning is well-designed instruction. Online learning environments have many capabilities and the potential to widen options and opportunities available to teachers and to learners. However, the key to changing conditions for improving learning is how these options and opportunities are utilised by teachers and learners. Technology is coming before pedagogy. The value of any technology for education is proportional to the need for that technology to realise educational objectives. We are constantly reminded that learning must be developed around learning needs, meeting educational objectives and producing viable graduates.*

> *However, at this stage of development, the effort put into exploring technologies to 'keep the cutting edge' is at the expense of equal investment in the underpinning educational design.* (Jasinski 1998, p.1)

The second study was carried out at the University of Illinois (1998–99). It is an extensive examination of what constitutes good teaching and training practice in the teaching sector, where online technology is being strongly pushed by administrators and policy-makers. The report is the result of a yearlong set of activities that involved university staff from '16 different colleges on three University of Illinois campuses'. The report focusses on questions such as: what constitutes good teaching either offline or online; survey of online provision of education in the United States and beyond; and the extent and validity of current evaluations of the effectiveness of online teaching and learning. The origins of the yearlong activity and the report lie in the academic disquiet about the 'computer revolution' and its pervasiveness, and the extent of financial, managerial and administrative 'hype' that accompanies the persistently future-oriented changes.

The evaluation criteria were generated on the basis of the posed question 'How do I determine if online teaching is successful?'. The scope of the evaluation was determined by the following general answer:

> *In the short term, before history answers this question, we think that a rigorous comparison of learning competence with traditional classrooms can and should be done. High quality online teaching is not just a matter of transferring class notes or a videotaped lecture to the Internet; new paradigms of content delivery are needed. Particular features to look for in new courses are the strength of professor–student and student–student interactions, the depth at which students engage in the material, and the professor's and students' access to technical support. Evidence of academic maturity, such as critical thinking and synthesis of different areas of knowledge should be present in more extensive online programs.* (University of Illinois 1999, p.3)

> *The seminar concluded that online teaching and learning can be done well if new approaches are employed which compensate for the limitations of technology and if professors make the effort to create and maintain the human touch of attentiveness to their students. Online courses may be appropriate for both traditional and non-traditional students; they can be used in undergraduate education, continuing education and in advanced degree programs.* (University of Illinois 1999, p.1)

These findings were supported by Jasinski (1998), when she examined the Australian context.

These types of evaluations are rare because they bring together so many of the issues related to the online delivery of education and training.

interactivity

One of the frameworks for thinking about online pedagogy for the support and delivery of education and training is organised around the concept of 'interactivity'. This term can be used to refer to levels of engagement with computer-based learning resources, everything from sitting and receiving information and activities with the learner ostensibly in 'control', through to collaborative relationships with others online in a constructed environment where the learner pursues interests and ideas with some scaffolding of support:

One of the frameworks for thinking about online pedagogy for the support and delivery of education and training is organised around the concept of 'interactivity'.

> *While interactivity as a concept has retained a high profile throughout the history of computer-based learning, its interpretation has undergone a metamorphosis and continues to be regarded as complex and difficult to define.* (Sims 1999, p.258)

The extensive review of literature that informs the Sims study (1999, p.257) documents 'the many ways that interactivity can be interpreted and the critical role that design and development plays in creating effective interactive encounters'. He concludes by listing some of the preconditions that ensure that the process of 'interactivity' is pedagogically sound:

- *the structure of materials is crucial to the level of interactivity. They must motivate and engage*
- *knowledge of the intended audience is a prerequisite to the design of high quality interactive resources*
- *the person using the resources must have a degree of autonomy that makes them active and not passive*
- *the materials must have the capacity to 'adapt' to learner input*
- *the learner must have the ability to interconnect new learning with existing knowledge schema*

Simply making something 'interactive' by adding a communication function is clearly not enough.

However, the different interpretations imply that 'interactivity' in and of itself is no guarantee of effective learning, as Sims (1999) points out:

While acknowledging that computers can support an interactive experience, Heath (1995) concludes that interactivity is essentially a function of human–human communication and that its current use has resulted in 'at best confusion and at worst deception'.

conversation

If the precept that face-to-face contact between teachers and students is the most desirable way to interact in a learning situation, then the pedagogy of online environments which most closely approximates this should be ranked highly in terms of teaching and learning strategies. Some forms of computer-mediated communication (CMC) are beginning to replicate the conversations of the classroom in written forms.

Email, discussion forums, and Listservs attached to online delivery and support of education and training provide a new environment for communication between student and student, and student and teacher/trainer. This new mode of communication has clearly identifiable new conventions. These are discussed by Abdullah (1999) in a review of the literature. This evaluation of CMC looks at the features of the new environment, its pervasiveness, its functions and the directions for further evaluation and research that are needed. It is one of the few structured collections of research material in this area.

The extent to which conversation dominates a teaching and learning situation obviously varies a great deal across content area and assessment milieus. The report from the University of Illinois Faculty Seminar (1998–99) supports this assertion with research and anecdote:

> *Sims (1996, p.258) also observed the presence of linguistic features of both written and oral discourse in her study of the social context, formal cues, and linguistic features of electronic mail. Electronic mail, she notes, is deliberate in that the writer has the opportunity to plan and organise the discourse. Yet, it has some of the spontaneity of oral discourse in that most of the users reported spending little time planning and revising electronic mail messages. This spontaneity may be what leads to misspellings and the use of unconventional punctuation, diction, and capitalisation in electronic discourse.*
>
> (Abdullah 1999, p.1)

Features of CMC that are similar to spoken language include:

- vocabulary similar to spoken language
- lexical density more similar to spoken language than written language
- short chunks of speech

- more active than passive voice constructions
- incomplete sentences
- uncorrected spelling
- bizarre layouts which result from speed rather than attention to graphic features
- informal tone

Conversations allow negotiation and constant modification to take place. Conversations can facilitate learning and can be pedagogically sound (Brookfield 1990):

> *While there is no one 'best' teaching method some methods and combinations of methods are better than others at realising the sort of constructive engagement with learning activities that lead to changes in understanding (Ramsden 1992). For example, Stevenson (1994) contends that, for learners to achieve expertise, learning needs to be deep, conceptual and reflective, with strong links between concepts and practice. Ramsden (1992) argues that teachers can encourage such approaches to learning by promoting reflective activity and dialogue. Thus teaching can be viewed as a form of conversation. Good teaching and learning involves rich conversations.*
>
> (McKavanagh et al. 1999a, p.2)

CMC has been evaluated from an unexpected direction. It has attracted the interest of linguists and sociolinguists who have been analysing the type and quality of the interactions in this new medium. They take as their frame of reference the 'corpus' of interactions that occur in the conversations between people using CMC.

Beyond the analysis of the linguistic features which indicate a far more conversational tone in CMC, there has been work done on the teaching learning implications of this form of online support (Resnick et al. 1993, p.363).

> *Conversations with online course instructors indicate that postings are considered evidence of students' critical reasoning, intellectual growth and thoughtful contribution to a topic of discussion, and assessed as such ... As online interaction becomes more widely used in formal academic situations, and as more students of all age levels participate in electronic discourse, language educators may have to consider how to respond to such unconventional language use and the structuring of ideas. Should these changes be met with acceptance or should they be redressed?*
>
> (Abdullah 1999, p.2)

learning styles and **online delivery** of education and training

Learners collect, synthesise, analyse and organise information to add to learning in very different ways. These differences have traditionally been strengths, built on creatively by teachers and trainers in the best of learning situations. The synergies of difference are a powerful tool in the hands of accomplished teachers and trainers.

The recognition of the different styles of learning implies that there is a need to take advantage of the multiple instructional strategies that are available. Mass-distributed learning does not always meet the preconditions for engagement. Similarly, the newer focus on CMC and a constructivist approach to teaching and learning may not necessarily hold all the answers either (Small & Grabowski 1992 as cited in Ross & Schulz 1999).

Learners collect, synthesise, analyse and organise information to add to learning in very different ways.

literature on learning styles

There is a large body of literature relating to learning styles. Kolb's Learning Style Inventory, the Myers-Briggs Inventory and Soloman's Inventory of Learning Styles (Montgomery 1998) are some well-known examples of frameworks which have been used to identify learning styles and discuss their impact on teaching and training practice. The literature often uses metaphors to describe the different learning styles observable in the environments created by the new technologies.

These metaphors include:

- 'passive and active learners'
- learners as having different 'functions of mental self-government' (Sternberg 1997; Dillon & Gabbard 1998; Small & Grabowski 1992; Schroeder 1994)
- dependant and independent learners

The key principle is that in order for students to benefit maximally from instruction and assessment, at least some of each should match their styles of thinking. Different methods of instruction work best for different styles of thought. (Sternberg 1997, p.115)

The question demanded by the acceptance of this key principle is whether the design of web learning is suited to all styles of thinking, and if not, what is missing and who is missing out (Brandt 1996).

In an extensive review of the literature on learning styles and VET, Brown (1998, p.4) concludes that:

> *Whether assessing individuals or cultural groups, it is apparent from the literature that learning styles differ. Finding ways to address these differences is a challenge to education. Vocational educators have a history of varied instructional practices through their promotion of hands-on learning and knowledge transfer. This tradition is now expanded through the advent of constructivisim, which attest that people construct knowledge based on the shaping of internal mental models, using previous experience, taking into account sociological/ emotional issues, and building problem-solving skills.*

implications of differences in learning styles

Differences in learning styles need to be accepted and accommodated in every part of the online delivery of education and training. For early users there is a certain attractiveness embedded in the machine, the software and the experience itself. Beyond this initial flush of enthusiasm, the range of interactions at the interface between user and technology is as broad as the range of learners and their preferences themselves.

Differences in learning styles need to be accepted and accommodated in every part of the online delivery of education and training.

Certainly not everyone is going to be entranced by learning this way. Cultural, economic, social and educational experiences come together to determine the mind-set that students bring to the learning activity. Work is only just beginning to establish what these attitudes are and assess their importance both for the teacher/trainer and the participant. The Warner and Choy (2000) study analysed the 'dispositional and skill readiness for flexible delivery, including online delivery' amongst a group of 70 VET learners. Warner and Choy (2000) found that the assumption of mass readiness and dispositional suitability was dispelled. The learners were not ready to engage with enthusiasm in this form of delivery.

The needs, impressions, reactions and learning styles of the students/ participants need to be monitored with a lot more attention and precision to ensure that our enthusiasm for the new technologies matches the capacities and inclinations of students and teachers (Mitchell & Bluer 1996).

navigational strategies

The navigational possibilities provided by the new technologies may or may not be a source of excitement, engagement and learning for the student. What appears in some cases to be highly liberating, in other cases works against the best interests of the learner. The ease with which students may get lost in amongst the links and trails of the internet and the web may produce a race of cyber nomads who have visited lots of places and not much more.

Small and Grabowski (1992) warn that too much user control can lead to navigation decisions resulting in either skipping pertinent content or leaving the tutorial program before all content has been thoroughly covered (see also Schroeder 1994). Similarly, learners who are less confident and who have low levels of technological and personal self-efficacy may find the constructivist environments threatening and confusing (Dillon & Gabbard 1998; Wallace 1999).

computer-mediated communication

The current discussions of the communicative capacity of the new technologies (Hamilton 1999; O'Donnell 1999; Rasmussen & Davidson-Shivers 1998; McKavanagh et al. 1999b; Abdullah 1999) represent a move away from the concept of a mass market for education and training, towards a more individualised form of learning and instruction (Hamilton 1999). This is an acknowledgement of the needs and styles of the learners. One form of online communication which opens up learning possibilities is 'electronic discourse' (Abdullah 1999), as mentioned in the chapter on 'Conversation'. The linguistic freedoms which it displays allow students to use this technology in new ways. There is a focus on almost Morse code communication where ideas and questions and answers are more important than the conventions established over long periods of time. For those who fear the writing process and the sense of assessment that is implied with it then the CMC represents a concession to learning styles which are more informal and less convention ridden.

deficits and differences

The inclination is quite strong to regard differences in learning styles as a kind of deficit, and the literature is underpinned by a compensatory tone at times. When this inclination is overlaid by the focus on assessment in the new world of credentialling in the education and training sectors, certain types of learners may be inadvertently excluded. The field may have narrowed so much that some are not even in the race (Sternberg 1997). The other consideration is that this new factoring in of learner styles and preferences, and the commitment to higher degrees of interactivity

between teachers/trainers and students, is an exceptionally expensive road to travel. Rather than replacing teachers/trainers it demands new roles, more time and different industrial and working arrangements, all of which have a considerable and unattractive price tag attached to them (West 1998). At a time when the trend is to reduce costs, raise productivity, and shift the cost of education and training from the public purse to private provision, this fact of life is not palatable (Green 1999).

user skills

People relate to technology with different expectations, anxieties and levels of skill. The levels of user skills are the technical preconditions for learning in much the same way that reading abilities are the preconditions for dealing with print-based materials. Being a new or non-reader impacts on how well the learner can relate to the materials being presented. Being a new or non-user of technology impacts with a similar set of constraining influences. Newer users may be nervous of the technology (Carlson et al. 1998). Children and young people in school or training tend to be less nervous, but again the differentials created by the amount of domestic access they have enjoyed influences this level of anxiety. 'Even experienced students face challenges in a new kind of learning environment and they may find that skills that served them well in a traditional classroom are inadequate for learning via the world wide web' (Carlson et al. 1998, p.144).

People relate to technology with different expectations, anxieties and levels of skill.

Most adult learners experience anxiety about their learning (Moore & Kearsley 1996 in Carlson et al. 1998). 'It is important that students who lack essential learning skills or who have a high degree of anxiety about web-based learning be given opportunities to master the necessary skills and overcome their anxiety.'

newer users

Novice students/participants have to negotiate the conventions, protocols, technical mysteries and the sometimes overwhelming levels of unreliability of the new technologies before they even begin on the tasks provided for them (Open Learning Program 2000). In spite of the 'you just have to' encouragements offered by the proficient users, who have frequently forgotten the trauma associated with their own learning, newer users frequently internalise their failure preferring to blame themselves for their inabilities rather than sheet the responsibility home to the construction of the program or type of support being offered.

The literature indicates that if the education and training is highly ordered and guided, then students/participants need to know less about the technology (see chapter on student outcomes). However, this logically mitigates against the newer possibilities for interaction, CMC and the trend towards creating constructivist environments to encourage learner autonomy and independence. The skills required for searching, evaluating and managing information are sophisticated and their assumption may be highly intimidating for new users. Anxiety levels certainly seem to be greatest if the education and training is more sophisticated and constructivist. Clearly, what is needed is an equivalent commitment to improving the technological, navigational and critical literacy skills of students as part of, rather than separate from, education and training offerings.

factors influencing levels of user skills

The reservations described above may be overlaid by the cultural, socioeconomic, experiential and educational backgrounds which may be at best, different, and at worst, antithetical, to the new medium for learning.

The uniformity of teacher/trainer/resource expectations creates a highly inequitable set of expectations of our students. This problem will not be solved by deferring to the more communicative and constructivist opportunities created by technology. Research has shown that these opportunities go to those with relatively high levels of technological competence. Early users find these opportunities confusing and daunting (Ikegulu & Ikegulu 1999). Add to this the fact that the particular course may be needed for employment and may be accompanied by online assessment tasks, the attrition rate is partially explicable. No wonder people are asking for more informal and less pressured forms of lifelong learning (Research Forum 2000).

The data from the ABS (1999), as detailed in *Australia now—A statistical profile communications and information technology special article—Real time: Computers, change and schooling,* provide a picture of the differentials in experience which the population has. Proficiency with the technology can initially be thought of in socioeconomic terms.

Children learn the bulk of their sophisticated technological skills at home in front of their domestic PC. The age of the user is also influential. People over 27 years of age have troubles. Older people are nervous, often threatened and at a loss as to where to start. People from a non-English-speaking background, indigenous people and people with literacy problems may well find the medium culturally and educationally disenchanting.

Even with reliable access, these features may actually mitigate against take up. Those who use computers every day as part of their work can be less than enthusiastic about returning to the interface in their own time for further education and training. The medium may not hold any intrinsic motivation for the potential participants, even if they are confident communicators. In fact, quite the reverse may apply (Brennan 2000).

The assumption that students come to the interface with adequate skills to even fire up the box is quite wrong-headed thinking. They come with all sorts of backgrounds and experiences which attach themselves to their encounters with new learning generally, and technology specifically (Brennan & Green 2000). Teaching and learning that does not build in deference to these factors is flawed both in conception and practice.

focus on skills and outcomes

This chapter focusses on studies about improved student outcomes online. It reports on both quantitative and qualitative measures of improvement and concludes with a list of preconditions that will contribute to effective online learning:

> *The moment Alice appeared, she was appealed to by all three to settle the question, and they repeated their arguments to her, though, as they all spoke at once, she found it very hard indeed to make out exactly what they said.*
>
> (Alice in Wonderland—Lewis Carroll)

overview

The question of improved student outcomes in education and training as a result of online delivery is crucial. The investment of time, money and energy requires a clear demonstration of an improvement in student outcomes, not merely a replication of existing outcome levels. The literature indicates that there is a need to apply both quantitative and qualitative measures to the study of student outcomes and that there are significant barriers to improvements in these outcomes that must be dealt with before we can claim that there is any positive causal link. The preconditions for improved student outcomes appear later in this chapter.

The literature indicates that there is a need to apply both quantitative and qualitative measures to the study of student outcomes.

quantitative studies

Studies of research articles and other publications show that there are few clear examples of technology contributing to improved student outcomes. The most significant results indicate that outcomes achieved using technology are at least the same as those for students in traditional settings (Alexander & McKenzie 1998; Davies & Mendenhall 1998).

Mitchell and Bluer (1996) repeat the warning about prematurely attributing improvements to the adoption of new learning technologies (NLT). Definitive results

are not available. An astonishing study produced by the US Milken Exchange (Schacter 1999) aggregated student achievement information from 500 individual studies of computer-based instruction. The results showed both negative and positive changes in student outcomes across all sectors. However, the methodologies that were used to generate the results of these 500 studies claimed almost no attention in the published report.

Clark, in his study of the power of multimedia media (1997), makes the following comments about the claims of technological effectiveness and the methodologies used to justify these claims:

> *The comparative analysis studies that sometimes accompany educational evaluations of multimedia usually measure educational effectiveness against the effectiveness of other forms of teaching and learning (Reevs 1993; Brouwer-Janse 1996). In these sorts of investigations the hypothesis is that multimedia is more powerful or just as effective for learning as are lectures or classroom instruction. What is usually being tested, by comparison, is how effective multimedia is as a learning or training method, by comparing the effects of its power against a control group taught by traditional means. Comparisons of this sort have not demonstrated that multimedia dramatically improves learning (Latchem et al. 1993) rather they usually indicate that multimedia is as effective as traditional forms of instruction.* (Clark 1997)

Similarly, an extensive review of the quantitative research literature on the impact of hypermedia on learner outcomes by Dillon and Gabbard (1998, p.323) surveyed the results of approximately 30 items. They suggest that:

> *literature is strong on claims but, so far, short on supporting evidence from studies of learners, as some researchers have continually noted. Landauer (1995) reported that despite numerous published reports on the topic of hypermedia use, he could only find nine studies of human performance with this technology that met even minimally acceptable scientific criteria.*

Some of the research limitations that they identified are:

- lack of clarity about grouped headings such as 'effectiveness' and 'efficiency'
- lack of statistical significance in the results of much quantitative research
- the use of specific applications and definitions peculiar to the researchers themselves which make comparability of the results difficult
- lack of attention to sound quantitative methodology
- effects of the tasks which were done by the students to measure improved 'outcomes' were not 'systematically manipulated'

- results were task dependent and limited in some cases (Dillon & Gabbard 1998)

A comparison between online and classroom students' achievements for particular lessons and test scores were not significantly different:

> *The majority of project evaluations in this study were reaction evaluations, representing a level one evaluation in Kirkpatrick's model. A minority of evaluations occurred at level two—the extent to which students changed attitudes, improve knowledge, and/or increase skill as a result of using the program. One project reported a level three evaluation—a review of the transfer of learning to the workplace. There were no projects which reported undertaking a level four evaluation.* (Alexander & McKenzie 1998, p.254)

The preliminary results from a study undertaken by Beven (1999) also indicate that evaluation of student learning outcomes and student learning processes are limited:

> *Given the very nature of the computer some data regarding user behaviour can be easily collected including the sequence of navigation, time spent at nodes, time spent on various activities and depth of immersion into hierarchically structured information. The problem is that because of the nature of this data, it does not provide complete, or often any answers to many questions. Thus, researchers need to develop new techniques for analysing patterns of user interaction ... the methods range from simple frequency counts to complex path algebra, from protocol analysis to ethnographic studies.* (Beven 1999, p.68)

Not everyone is so circumspect and perhaps this explains the periodic eruption of technological euphoria.

qualitative measures: process not product

Quantitative information, where comparisons are made about achievement on discrete measurable tasks in the online environment and traditional teaching settings, is perhaps the wrong way to look at an evaluation of learning outcomes. The performance criteria may be too narrow or too task specific to generate any usable data.

Qualitative studies of student learning outcomes have been suggested as a way of assessing the relationship between online delivery of education and training and student outcomes. This methodology fits more appropriately with the communicative and interactive capacities of the technology as opposed to its mass distributive functions. The newer teaching and training opportunities provided by the medium

need to be thought about using different tools. The problem is, of course, that reporting on such concepts as 'extension', 'support', 'enabling' and 'accessibility' is very difficult, long term, expensive, researcher hungry and infrequent.

Qualitative studies of student learning outcomes have been suggested as a way of assessing the relationship between online delivery of education and training and student outcomes.

The much higher level of generality of these outcomes makes their definition and measurement a problem, particularly in the VET sector where statements of competence and assessment do not include 'soft' process-orientated outcomes. In comparison to the hundreds of highly focussed, quantitative studies of student outcomes, qualitative analysis must look at the complexity of the factors involved in online learning and create conceptual frameworks that explain not only the products of learning, but the processes that have or have not contributed to it.

Laurillard (1993) contends that effective teaching and learning take place when interactions between teacher and students are responsive and reactive. These are the conversational exchanges that are at the heart of her writing:

> *Some of the early adapters have, acting on Laurillard's model, moved swiftly into the development of course material and looked at the microscopic details of structure and integration. Others have tended to use traditional methodologies ... and are influenced by behaviourist principles.*
>
> (Slay 1997, p.2)

An improvement in student learning outcomes could be judged, beside the extent to which the media encouraged these effective learning conditions. This work is being done in the Australian VET sector by Beven (1999) and McKavanagh et al. (1999a, 1999b) and is reported on in their paper and in their work in progress.

a **mixture** of measures

Other methods of evaluation have been used to assess improvements and changes in student outcomes who use technology in the support or delivery of their education and training. The Alexander and McKenzie (1998) study—commissioned by the Committee for the Advancement of University Teaching (CAUT)—is an extensive and comprehensive study using both quantitative and case study information to explore issues surrounding the take-up rates of information technologies in the university sector. It has a particularly relevant section on the 'Evaluation of IT

projects for university learning' which examines both the effects of the new technologies on student learning and the types of teacher learning that need to take place to accommodate the new technologies (pp.230–53). The results of this study can be transferred to the VET sector.

The benefits to students include improvements in:

- quality of learning
- productivity of learning
- access to learning
- student attitudes to learning

Examples of positive learning outcomes which resulted from students' use of information technology (IT) projects, as illustrated by the major case studies, include:

- the opportunity for students to interact with others internationally and gain a more sophisticated and global understanding of complex international political issues, while gaining information literacy in the process
- improved understanding of concepts which students are known to have difficulty within a range of disciplines, through the use of interactive multimedia animations, simulations and microworlds
- the development of information and technological literacy in the context of learning to solve real-world problems through the use of databases and email
- enhanced communication between part-time students and their lecturer, through the use of a computer-based conferencing tool over the internet
- the acquisition of information such as language learning, where a high component of factual recall is required
- learning skills and knowledge of a particular discipline in the culture of its use in a working organisation, through participation in a simulation over the internet
- the facility for students to assess their own learning of concepts, through computer-based qualitative and quantitative assessment modules (Alexander & McKenzie 1998, p.ix).

These results confirm the assertions of other studies (Brennan 2000). Interactivity, communication, simulation of the 'real world' and the development of the information literacy skills encourage the learner to become more autonomous and self-regulating of their own learning. This report again raises the question of

what are the measures of student success. The solution that the authors found was based on their accumulated experience and wisdom:

> *In the absence of evaluation data in a large number of cases, judgements were made about the success of the outcome by the team conducting the evaluation, after reviewing the project's use and interviewing staff and students where possible.* (Alexander & McKenzie 1998, p.x)

A blending of quantitative and qualitative measures of student outcomes is certainly needed. This has been achieved in a number of ways. In a report by Mitchell and Bluer (1996) the idea of a 'testbed' of evaluation is presented. 'Testbeds use an array of qualitative and quantitative measures including surveys of teachers and students, in depth interviews, analyses of recorded communications and products and classroom observation' (Mitchell & Bluer 1996, p.3).

Interactivity, communication, simulation of the 'real world' and the development of the information literacy skills encourage the learner to become more autonomous and self-regulating of their own learning.

Until we have such a clear and multifaceted picture of outcomes it is foolish to make either doomed or extravagantly enthusiastic claims about the capacities of the technology to deliver improved student outcomes.

preconditions to **improved student outcomes**

It seems from the literature that improved student outcomes will not be guaranteed simply by going online.

Any improvement of student outcomes using online technologies has some important preconditions:

- the creation of a sense of ownership and community amongst the learners (Cochenour & Reynolds 1998)
- learning strategies which are flexible and suited to the particular needs and contexts of the students/participants
- reliable and regular trouble-free backup of both the technological and intellectual and social kind (Brennan 2000)
- meticulously planned materials with lots of room to move and grow
- regular evaluations of both the student's progress and student temperament

- students have some knowledge and confidence with the technology (Misko 2000)
- students are independent learners with well-developed levels of intrinsic motivation (Misko 2000)

The concept of 'multiliteracies' explained by Cope and Kalantzis (1998, p.29) is also relevant to the discussion of improved student outcomes. They maintain that:

> *[t]he increasing use of flexible delivery systems and distance mode delivery represent a significant shift, necessitated by an increased emphasis on on-site workplace learning and improved provision in remote and rural communities. Not only are these delivery systems more dependent on written text; they also involve new relationships of visual information to text, such as diagrams, icons and charts. Not only have new communication technologies increased the language, literacy and numeracy demands of work and vocational education and training, literacy is now a critical aspect of the human–technology interface.*

Given these new demands, student outcomes will only improve if these changes are accepted and catered for in terms of curriculum content and pedagogy. Bigger language, literacy and numeracy demands make the vulnerable groups of students even more acutely vulnerable. This fact is reflected in the falling retention rates reported by Cope and Kalantzis (1998).

It seems that the learning and the improved student outcomes might be more effectively ascribed to the leisure use of the technology than to formalised delivery.

The Warner and Choy ANTA-funded project which looked at the 'readiness' of VET participants to take up the opportunities of flexible delivery and online learning (2000) provided evidence that VET participants preferred traditional methods of course delivery and were neither ready nor inclined to take up online delivery and support options. The participants were not proficient technology users and had less dispositional preferences for flexible and online delivery than is ever discussed. Self-direction is a skill which needs to be encouraged and not assumed.

As always there is a lot of activity outside the prescriptions of courses developed by education and industry to deliver and support online learning. The lessons that young people, particularly, are learning through the use of recreational and domestic computers have been identified by Lee (1999). They include outcomes such as:

- self-control
- independence
- responsiveness to change
- multi-tasking
- networking
- collegiality
- constructivist/discovery approach to learning

It seems that the learning and the improved student outcomes might be more effectively ascribed to the leisure use of the technology than to formalised delivery. These skills are definitely transferable, portable and predominantly learnt outside the confines of formal instruction. We may in fact be taking credit for something which we have not done (ABS 1998).

measures of effectiveness of online delivery

This chapter focusses on different measures of the effectiveness of online delivery. It looks at the concept of effectiveness from the perspective of the education or training organisation, the teacher/trainer, the industry policy-maker and the individual learner.

The concept of 'effectiveness' remains a poorly explained concept, where the reader is left to make judgements about how all the advertised benefits will translate into learning.

overview

In the absence of definitive data on the improvement of student outcomes, the debate about the effectiveness of online delivery of education and training becomes murky.

The concept of 'effectiveness' remains a poorly explained concept, where the reader is left to make judgements about how all the advertised benefits will translate into learning. When claims about effectiveness are made, they often come with a kind of textual authority from a restricted set of official sources. The Mitchell and Bluer (1996) matrix on p.45 gives some guidance about how some of the different constituencies within education and training might evaluate effectiveness.

effectiveness for the **education/training organisation**

The education and training organisation may have very different and competing measures of effectiveness. Public providers are under pressure to reduce the costs of delivery. If you are in the business of administering education and training with an eye to the cost structures and the profitability of the enterprise then the reduction in human resources and their replacement with relatively low maintenance hardware and software is attractive. The relative quality of the resources or the mode of provision is a hard call in the face of reduced staffing costs and the casualisation of the workforce.

Economies of scale 'and the potential for mass customisation especially in areas of codified knowledge and algorithmic skills' (Massey & Zemskey 1996 in Mitchell & Bluer 1996, p.2) are attractive options for the pressured bureaucrat.

> *The literature reviewed revealed that a strong emphasis on learning as the chief criterion for using technology is not a feature of recent Australian studies. This view was reinforced by the consultations undertaken.*
>
> (Mitchell & Bluer 1996)

Qualitative and quantitative performance indicators

Categories of indicators		Indicators
Indicators of effective learning	The course/module demonstrates:	1 clear learning goals 2 challenging learning tasks 3 realistic performance based assessment processes 4 interactive instruction techniques 5 supportive learning environments
Indicators of effective learning technologies	The technologies used enable:	1 improved access for work-based and disadvantaged learners 2 ease of operability, i.e. technologies are compatible and transferable 3 ease of use by learners 4 interactive instruction techniques 5 a range of functions, e.g. multimedia, authoring
	The technology is supported by a technology plan that includes:	1 how the technology is to be used for learning 2 how people are to be trained to use technology 3 how the technology is to be managed 4 how each stage of the process is to be evaluated
Indicators of improved learning outcomes	Student performance as determined by:	1 standardised tests 2 module task assessments 3 teacher judgement 4 employer/workplace assessments and judgements 5 assessment of transferable IT skills 6 student self-assessment
	System indicators include:	1 increased participation 2 faster student throughput 3 higher student retention 4 higher enrolments/re-enrolments 5 improved vocational outcomes 6 improved access for workers and disadvantaged

Source: Mitchell & Bluer 1996, pp.8–31

effectiveness for the **individual learner**

Student perceptions of the effectiveness of the new technologies is a relatively under-researched and under-reported area. The benchmarks used to make these judgements are frequently external to the student, as with the hundreds of studies on the relationship between technology and student outcomes. Questionnaires at best, and 'smile sheets' at worst, attempt to map levels of student satisfaction. Claims about effectiveness are made on the basis of these results. Case studies, interviews and focus groups that get beyond the surface of student performance to issues of motivation, engagement and achievement are beginning to gather credibility as measures of effectiveness (Selwyn 1999; Slay 1997; Wallace 1999). The systematic analysis of communication and interaction in online teaching and training environments is also providing another richer source of information about how students learn online and the relative effectiveness of this learning (Ross & Schultz 1999; Jasinski 1998).

> The relative quality of the resources or the mode of provision is a hard call in the face of reduced staffing costs and the casualisation of the workforce.

The Else and Hicks study (1998) of the delivery of vocational training to remote North West Australia examines the 'feasibility' of the technology. It not only looks at the technological issues but extends its focus to see how the possibilities of technology match with the predispositions and life conditions of the intended student audience. The final recommendations of the study reflect detailed literature review, the interviews and consultations that were held during the life of the project. The conclusions suggest that in this region of rural and remote Australia, learning online is feasible, but it will only be effective in terms of student outcomes if the stumbling blocks are removed.

These include:

- low levels of computer literacy amongst the participants
- low levels of general literacy
- prohibitive costs of the technology and its unreliability
- restricted customising of the curriculum resources to fit with the communities needs
- low levels of local tutor and mentor support for the programs

Technology in and of itself does not guarantee anything (Else & Hicks 1998). The Kilpatrick study (1997) identified a similar list of preconditions for success. From the student's perspective, the effectiveness of online delivery is measured in terms of:

- lifestyle (Else & Hicks 1998)
- preferred mode of learning
- degree of comfort with the new learning technologies (Mitchell & Bluer 1996; Warner & Choy 2000)
- cost (Marquardt & Kearsley 1999)
- demands of the workplace or the educational institution
- comparisons with other available forms of delivery

effectiveness for the **teacher/trainer**

Teachers and trainers in education and VET contexts have very mixed reactions to the issue of the effectiveness of online delivery and support. The age profile of the teaching and training profession is significant. People over the age of 27 years report anxiety and stress associated with using the new technologies (Pattinson & Di Gregorio 1998). The average age of teachers and trainers hovers around the 45-year mark. The gap in experience and confidence is immediate. 'The move towards technologically mediated teaching and learning meant that academic staff found themselves teaching in unfamiliar territory' (Rice 1997, p.3).

Teachers and trainers also report on the apparent devaluing of their expertise and experience (Noble 1998 in University of Illinois 1999). They feel that their roles have been subverted by the designs and functions of the new technologies. They question not only the effectiveness of the technology but also their own personal effectiveness as teachers and trainers.

The differentials in technological skills which are noticeable across the teaching and training sectors drive further wedges between the proficient users and those who have problems with the basic functions. Effectiveness to some extent is predicated on the level of technological skill rather than on the ability to teach or train. Other teachers and trainers report that the separation of students from staff, the expanding time impositions that come with the new and more interactive technologies, and the trend towards casualisation have contributed to the sense of 'deprofessionalisation' and disenchantment.

The global pattern towards the commodification of education and training, and the pragmatics of competition and user choice, frequently leave teachers and trainers

feeling more like 'operators' than 'contributors' or 'facilitators'. If they believe that their roles are transactional and potentially transformative, and that the new technologies do not provide suitable opportunities for these principles to be recognised, then their perceived levels of effectiveness plummet quickly. The idea that 'technology is driving pedagogy' supported by government and industry relegates teacher/trainer skills and accumulated wisdom to an often-unimportant position in the equation. Staff development seems to follow, rather than match, innovation. The constant game of 'catch up' further reduces the sense of ownership of the process of teaching and training (Brennan 2000).

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effectiveness for **industry**

In industries, businesses and organisations where education and training are not the core activity, measures of 'effectiveness' are regarded quite differently. Costs balanced against benefits explicitly underpin decisions about how, when and in what mode training will be delivered.

> *In practice, decision makers tend to prioritise some factors over others and use these to make selections. Often cost considerations are an overriding concern—forcing the use of less expensive options ... media selections are frequently made on a very non-rational basis, e.g. a persuasive vendor presentation or simply copying what another organisation is doing.*
>
> (Marquardt & Kearsley 1999, p.238)

effectiveness for the **policy-maker**

The measures of 'effectiveness' which inform policies on the use of online technologies in the public provision of education and training in Australia are a complex mixture of:

- deference to the needs of the learner
- the need to reduce public expenditure on education and training
- an acceptance of the technological imperatives
- the information coming from evolving practices of cost–benefit analysis. Not all of these factors are weighted equivalently, with issues of cost often appearing as the driving force in decision making

Ryan maintains that there is:

> *No consistency in cost assessments in the literature with wildly disparate costs being quoted ... even a subject with only 'passable commercial value' will cost about $US6 million to develop (based on ten modules at US$600 000 per module) and half that per annum to maintain.* (Ryan 1998, p.15)

Betz (2000) suggests that 'Every hour of web instruction is costing about 100 hours of preparation'.

The industry benchmarks for web-based instruction costs provide another view. Carlson et al. (1998) cites a paper by Golas (1993) presented to the Industry Training Systems Conference in the United States where he reports:

> *Development of courseware requires specialised expertise and time. Recognised industry standards are from 30–600 hours of development time for every new hour of instruction delivered (Golas 1993). The wide variance is due to the mix of complexity of the subject matter and the type of media and method that is chosen. If we were to choose to teach a relatively low-level skill with some interactivity and utilise a multimedia environment, one might find that 100 hours of development time per new hour of instruction may be required ... The industry also recognises that a start up project would require much more than the average figures.*

Holzl and Khurana (2000) accept the high costs of development but raise the issue of shifting longer term costs between high cost development and lower cost delivery. Frankhauser and Lopaczuk (1996) point out that students complete in shorter periods of time.

> *It is a generally accepted rule of thumb that multimedia-based instruction reduces instruction time by around 50%. Two possible reasons for this reduction are better instructional design and options to omit content that is not needed by the learner. This has particular relevance for industry as it reduces the amount of down time for staff.*

This is referred to as 'learning compression' which is cheaper but exhausting (Frankhauser & Lopaczuk 1996, p.49). Publicly some degree of reality seems to have settled in. 'High quality online education is neither cheap nor easy. The increased costs involved in developing and delivering online programs have to be included in any risk/benefit analysis' (Open Learning Program 2000, p.30).

Transmission of information and course materials is a relatively cheap activity. However, the further we move along the continuum of interactivity and communication the greater the costs will be in terms of staff support, materials design and assessment.

implications of online delivery

overview

This section examines the implications of online delivery for instructional design, curriculum design and teachers and learners in a constructivist online environment:

> *It is probably no accident that constructivisim is gaining popularity and momentum at the same time interactive, user friendly computer technologies are becoming widely available. The computer offers effective means for implementing constructivist strategies that would be difficult to accomplish in other media.* (Driscoll 1994, p.376)

Constructivism is a philosophy of learning predicated on the idea that individuals 'construct' new knowledge as they integrate new experiences and modify existing patterns. It acknowledges that students develop their own styles and preferences for learning using a variety of different resources. The interactions between students/ materials/colleagues/teachers and facilitators can be both formal/guided and informal/ exploratory. This process is frequently a collaborative activity.

Constructivism in an online environment introduces new demands on teachers, trainers, students, methods of instructional design and curriculum development.

Bull et al. (1999) describe four stages of facilitated learning in a constructivist environment. They are:

- Students are exposed to new material that is linked to their existing knowledge.
- Coaching is provided to assist students in assimilating and accommodating the new material.
- Students' understandings are refined through testing the validity of the new material.
- Students are given multiple opportunities to practice and apply the new material.

Constructivism in an online environment introduces new demands on teachers, trainers, students, methods of instructional design and curriculum development. These new demands are explored in this chapter.

implications of **online delivery** and **support** of education and training for **instructional design**

The potential freedom of the new technologies is well suited to constructivist strategies (Driscoll 1994). However, the more interactive, navigationally focussed and communication hungry technologies also require thoughtful implementation, scaffolded support for students, and teachers and trainers who are both confident and comfortable with this new way of working (Holzl & Khurana 2000). There is nothing magical in the medium which guarantees the creation of an effective constructivist environment. Lebow (1993) explores the implications for online instructional design and identifies the following factors as being important. Instructional design must:

- increase emphasis on the affective domain of learning
- make instruction personally relevant to the learner
- help learners develop skills, attitudes and beliefs that support self-regulation of the learning process
- balance the tendency to control the learning situation with a desire to promote personal autonomy (Lebow 1993; Honebin, Duffy & Fishman 1993 in McLoughlin 1999)

The Christchurch Polytechnic study which documented the development and implementation of the internet-based delivery of an industry commissioned course concluded that the 'principles of creating good learning experiences are the same online and off-line' (Sanders 1998).

The McKavanagh National Research and Evaluation Committee (NREC) study (McKavanagh et al. 1999b) found that the new technologies have not yet been matched with an equivalent change in the instructional design of the learning materials. Most importantly, the flexibility and encouragement of interaction has not been 'designed' for and traditional materials and methodologies still dominate the materials prepared for online learning.

designing online materials

Instructional design has attracted a lot of interest in the past few years as the modes of delivery of education and training move out from their traditional face-to-face

encounters into more distributed forms. Issues of design have assumed a new importance. The literature on instructional design has been growing steadily and presents some quite different perspectives on this issue (Carlson et al. 1998; Sherry 1995; Dillon & Gabbard 1998). There is some inclination to integrate sound learning principles into the design of online materials. Ideas such as individual learning needs, learning styles, strategies and preferences have become linked with the skills of instructional design (Richardson 1994 in McLoughlin 1999). However, under the financial and competitive pressures of intellectual profit making, students are often expected to make the best of what they have, and materials sometimes remain stagnant in their conception, flat in their design and unaccommodating in the styles of learning which they match:

Instructional design has attracted a lot of interest in the past few years as the modes of delivery of education and training move out from their traditional face-to-face encounters into more distributed forms.

> *[T]he reality is that in many institutional contexts the pressure of student numbers and scarcity of resources limit the scope of learner needs analyses. Instructional material often remains fixed, unvaried and static, adaptive to individual needs only in minor ways, if at all.* (McLoughlin 1999, p.213)

information design and instructional design

The focus on information design dominates commercial web publishing. It is motivated by the need to make material attractive, saleable, convincing, informative, stylish and easy to navigate. Instructional design has a very different charter. In the first instance, it is about providing information in educationally well-organised ways to maximise student learning. Beyond this minimum function it also provides the 'scaffolds' and communication tools for independent learning and contact, structuring information to optimise its usefulness there is a need for a balance between those with the toolkit skills and those with the knowledge of learning and instruction. The separation of functions in many organisations, providers and institutions has increased the gap between the information designers and the instructional designers and the practitioners (Brennan 2000). This has produced professional disaffection amongst the practitioners and reduced the possibilities for collaborative development which would ensure a better balance between pedagogy and content. This report not only looks at the factors that contributed to successful learning outcomes but it heroically takes on the identification of 'factors contributing to an unsuccessful outcome' (Alexander & McKenzie 1998, pp.xi-xiii). These can be broadly characterised in the following ways.

an IDEAL piece of educational design

The authors developed a 'composite profile of a program which is successful in improving learning in the originating institution' (Alexander & McKenzie 1998, p.x). The profile has features which can be summarised in the following way (Alexander & McKenzie 1998, p.x–xi).

The successful online project is:

- well designed and based on a recognised student need
- supported technically
- providing a service or access which cannot be passed on in other ways
- well financed and realistic about time constraints
- devised by a project team which works as a group with a clearly designated manager for the period of the project
- serviced by adequate and reliable access to both the hardware and software needed to complete the project
- evaluated throughout its life and adjusted on the basis of the evaluations
- supported by the management and staff of the workplace

This kind of checklist/flow chart is supported by the results of two projects from the Educational Services Division of TAFE New South Wales (Open Learning Program 2000, p.29) which looked at 'best practice' tools and instructional design based on 'current educational theory ... different learner profiles, various types of effective learning strategies and possible mediums for delivery'.

Ikegulu and Ikegulu (1999, p.20) have identified some of these technical limitations of design as being limited:

- screen space
- page size
- resolution
- forward and backward paging

These intersect with different styles of learning, different levels of technological proficiency and different preferences for the media in which the learning is taking place (Ikegulu & Ikegulu 1999).

Window types in computer screen design and even the colour of the screen can affect students learning. Reading abilities are also important. The kinds of instructions that are given can either accommodate or alienate students:

Instructions that are discordant and concordant to students' learning styles can be facilitating or debilitating depending upon the students' information processing capabilities and background (Elliot 1976; Eysneck 1993; Griffin & Franklin 1996; Hannafin & Hooper 1989; Kirby 1979; Kruck 1984; Rayner 1992; Scwarz, Bledie & Pastoor 1983; Spiro & Tirrè 1980; Tombaugh et al. 1987). (Ikegulu & Ikegulu 1999)

implications for **curriculum design**

The specificity of the curriculum or the training package which determines the content of delivery will have an influence on the variety of constructivist strategies that can be used online. Tight curriculum and assessment proscriptions usually focus on a controlled and formalised teaching and encourage a learning environment that is characterised by instructivist rather than constructivist views of what is needed.

The specificity of the curriculum or the training package which determines the content of delivery will have an influence on the variety of constructivist strategies that can be used online.

Dalgarno (cited in Clark 1997, p.199) explores this implication further and imposes a constructivist/instructivist framework around the forms of online delivery of education and training in Australia.

Constructivists usually define instructional technology as the generation of computer-based tools that provide rich and engaging environments for learners to explore. Instructivism typically leads to systems consisting of a single sequence through material in a one way individualised tutorial.

Constructivist views of teaching and learning focus on 'enabling objectives' (Lebow 1993), as well as the specific learning outcomes to be achieved. The medium and the message are equivalently important. This broadened view of curriculum builds on the different backgrounds, predispositions and experiences of the learners and puts them in touch with both materials and strategies that fit with their prior learning.

implications for **teachers**

Holzl and Khurana (2000) discuss the implications of adopting a constructivist approach with online teaching and learning and they point out that this view of teaching and learning will not just happen automatically and magically. There is

nothing inherent in the medium that promotes this change. 'So-called flexible delivery can just as easily be used to promote the same old "bad habits" as the traditional means of delivery' (Holzl & Khurana 2000). They go on to argue that proper implementation of a constructivist view of teaching and learning using online technologies requires a great deal more institutional support if it is to be effective in delivering improved student outcomes. This support has as its foundations:

- organisational developmental approach
- staff development
- integration of policy development

Feenberg (1999, as found in University of Illinois 1999, p.24) summarises the need for the centrality of the teacher's role to be accepted:

> *The best way to maintain the connection between online education and the values of traditional education is through ensuring that distance learning is 'delivered' not just by CD ROMs, but by living teachers, fully qualified and interested in doing so online. Prepackaged material will be seen to replace not the teacher as a mentor and a guide, but the lecture and the textbook.*
>
> *Interaction with the professor will continue to be the centrepiece of education, no matter what the medium. However, the focus on the teacher/trainer as being the 'guide on the side' [lends itsself] to the notion that the instructor can be nothing more than ... a non expert but motivational cheerleader.*

Students need 'scaffolding' through the new ways of learning. Learners have very different levels of 'autonomy'. Some are confident; some are not and everything in the middle. Design and delivery in a constructivist environment must keep these facts in the forefront of activity. Assessment strategies must complement the process and not detract from it.

Every introduction of new resources influences the structure and operation of the classroom or training site (Bennett, Priest & McPherson 1999). The changes brought about by online teaching and learning have created considerable new demands for teachers and trainers. The contexts of their work have changed and the skills demanded have altered accordingly (Bull et al. 1999). Teachers and trainers are not just pasting a new set of tasks onto existing practice. The nature and understanding of the role of teacher/trainer is in a state of adjustment, and often this is taking place amidst very patchy staff development. The extent to which teachers and trainers can adapt to the new work environment, and transfer their skills from one context to another, is often compromised by the confusing inflated public claims about the value of technology and their acute perceptions that all the changes have

delivered, are increasing workloads (Bennett, Priest & McPherson 1999). These impacts on teachers and trainers are explored in more detail below.

definitions of work

The definitions of the work of teachers and trainers have changed with the advent of mass distributed learning online. The move to more learner-centred and interactive technologies using the web, email, conferencing facilities, message boards, forums, MOOs and MUDs, Listservs and newsgroups have increased both the available teaching resources and the ways in which these can be used. Some of the new roles for teachers are 'in encouraging learner involvement, blending communication methods and fostering a sense of community amongst learners' (Bennett, Priest & McPherson 1999, p.208). Under these words lies a massive shift both in theory and practice overlaid by assumptions of technological proficiency and commitment (Pan 1998).

Teachers are being compelled to reconsider what constitutes good teaching whilst simultaneously being excluded from the activities which create their teaching and training contexts.

Teachers and trainers are frequently told that they are no longer the 'sage on the stage'. They need to move to the 'guide on the side'. This redefinition of their work and their conceptions of themselves is sometimes threatening, particularly if the mode of delivery is unfamiliar. They are being compelled to reconsider what constitutes good teaching whilst simultaneously being excluded from the activities which create their teaching and training contexts. This is not a form of change made in heaven.

A range of literature points to the possibilities for more student centred and constructivist approaches towards teaching and training. The question is: how do teachers and trainers cope with these possibilities, not just in terms of proficiency with the technology which in itself is a big issue, but how do they understand and then use the new environments for their work? These questions have few answers in the literature.

Many teachers and trainers feel as though they are flying blind.

> *So far, the literature on online facilitation has examined what the online facilitator does to promote thinking, conversations and learning. We have not located articles that have taken the critical step back to consider what it takes to help online facilitators develop the skills they need to do their specialised work.* (Zorfass, Remz & Gold 1998, p.9)

workloads

In a world where the economic imperative seems to be to reduce the costs of delivering teaching and training through casualisation of staff, reduced spending, user choice, competition and a concerted move to privatisation of these marketplaces, teachers and trainers are confronted by increasing workloads. The sometimes mandatory policy-driven requirements to add 'technology' to an already crowded schedule represents another layer of imposition. Resistance has been noted in a number of studies as a significant factor impeding the implementation of new delivery strategies (Mitchell & Bluer 1996).

assessment

The relationship between online delivery and support and assessment is also an issue for teachers and trainers. In 'distributed computerised environments' online assessment has become a growth industry. There has been a proliferation of self-checking devices, multiple-choice questions for the busy teacher or trainer and email-linked problem-solving exercises. One of the new trends is to blend assessment and learning so that the process becomes seamless and assessment almost invisible. The sanitised forms of assessment are not always appealing to teachers and trainers who frequently believe that assessment should be as rich a process as learning. They also believe that it should be a transparent process for students.

In the more interactive environments created by online delivery and support, the issues of how to assess the 'process as well as the product' are emerging as legitimate topics for research. Participation in online activities in some cases is an assessable task. The notion of getting below these 'turning up' strategies for assessment, and analysing the quality of student responses and the developmental, critical and reflective dimensions of student learning, is both difficult and in very early stages. In the absence of a body of knowledge, teachers and trainers are thrown back to quantitative practices. The creation of web sites or a record of the student's navigation through the information satisfies the criteria for assessment in other cases. In a constructivist environment, assessment becomes an even bigger issue for teachers and trainers.

staff development and teacher preparation

> *A preliminary study of CQU [Central Queensland University] teachers and students suggests that technical knowledge is only a part of what teachers need to know—teaching and interaction strategies are equally important.*
>
> (Bennett, Priest & McPherson 1999)

Reflection on practice is an increasingly important role for the teacher and trainer as they deal with the diversity of their students, the content of their 'subjects' and the new modes of delivery using technology.

Those who are just learning about technology seem to have the least time and inclination to spend on evaluating their practice. An innovation and a change in practice when accompanied by the learning of new mechanical skills occupies a lot of space and energy.

If education and training are to take advantage of the new technologies efficiently then new competencies in the profession have to be encouraged and planned for.

It is doubtful if people are able to independently monitor their own learning and then evaluate the learning of others in such a state of excited change. The literature recommends that teachers and trainers need the support of learning communities so that the benefits of the technology can be recognised in changed and improved practice (Bennett, Priest & McPherson 1999; Zorfass, Remz & Gold 1998).

Whilst the principle of using the medium to teach about the medium is an admirable one, there clearly needs to be more individual support for teachers and trainers in coming to terms with not just the technical but the pedagogical dimensions of their newer roles (Brennan 2000).

If education and training are to take advantage of the new technologies efficiently then new competencies in the profession have to be encouraged and planned for. Certainly there are some examples of systems across Australia providing excellent staff development projects—TILT (Technology in Learning and Teaching) NSW DETE; Learnscope, South Australia—but these do not attempt to cater for all staff or all online activities. There are some considerable gaps particularly in initial teacher/trainer preparation. The new technical skills required are only one aspect of the change.

Other considerations that are only now beginning to surface include:

- the reorganisation and realignment of roles
- the construction of knowledge
- new ways of teaching, training and learning
- assessment implications and the views of our own efficacy as teachers and trainers

Models for collaboration need to be negotiated and developed with teachers and trainers. These models of collaboration need to offer teachers and trainers the opportunity for professional exchange and communication, and systems for lodging and sharing online resources (Hamilton 1999). Stein, Smith and Silver (1999) explore new patterns for collaboration that are particularly applicable to teaching and training with the new technologies.

> *A fundamental assumption of the new paradigm is that decisions about professional development and other matters that affect teachers should be made collaboratively by teachers and professional developers ... collaboration does not mean that everyone contributes the same amount, in the same way, at the same point in time. Rather it should be viewed over the long haul, with the understanding that different individuals' skills will be called into play at different times. The key is to learn how to use differences in expertise and interest productively.* (Stein, Smith & Silver 1999, p.264)

The authors further argue that the long-term applicability and sustainability of professional development is contingent upon an appreciation of the culture and context of the workplace. In particular, teachers and trainers need support beyond the four walls of the professional development activity (Brennan 2000). The medium of technology and its potential for interaction and communication provides a wonderful opportunity for teacher reflection and growth in a supportive and collegial way.

Anecdotal and research-based evidence suggests that teachers and trainers feel that their skills, their talents and their creative and accumulated wisdom about teaching and learning are not being used in productive ways (Brennan 2000; University of Illinois 1999). Educational design and delivery decisions are being made by the divisions with responsibility for the introduction and maintenance of the equipment rather than achieving some balance between the skills provided by both teachers/trainers and designers.

The need for more collaborative and inclusive models is reiterated as a recommendation very strongly across the literature.

> *With the commoditization of instruction, teachers as labour are drawn into a production process designed for efficient creation of instructional commodities, and hence become subject to all the pressures that have befallen production workers in other industries undergoing rapid technological transformation from above. Like these others, their activity is being restructured, via the technology, in order to reduce their autonomy, independence, and control over their work and to place knowledge and control as much as possible into the hands of administration.*
> (Noble 1998 in University of Illinois 1999, p.35)

implications for **students**

Mitchell and Bluer (1996) found in their major study of the implications of new learning technologies in VET, that students were not always as convinced as they could be of the efficacy and the value of using technology to learn. The culture of small face-to-face classes and the contact and rapport that tends to build up between teacher/trainers and students in a formal TAFE or other training setting is impossible to replicate on screen, no matter how interactively busy the site might be (Palfreeman 1998). Certainly virtual learning sites have no walls but what might appear to be liberating for some learners is a deepening divide. In the case studies students were interviewed at length about their reactions to the new media for delivery. The collation of these responses is a fascinating and sobering picture of what students want in their VET delivery.

The culture of small face-to-face classes and the contact and rapport that tends to build up between teacher/trainers and students in a formal TAFE or other training setting is impossible to replicate on screen.

The major findings include the following:

- *There is a need to continually research students' attitudes to new learning technologies and to monitor their attitudes over a period of time.*
- *Some VET staff may have an idealised view of students as adult learners who want to gain more from their course than just the credit, while students may have an instrumentalist view of their VET course.*
- *Different cohorts of students will have different views of new learning technologies.*
- *There may be a danger in assuming that adult students are computer literate or Internet literate.*
- *Students' attitudes to courses involving new learning technologies will be influenced by the way their needs are addressed. These usually include the need for advice, access to learning materials, communication and administrative assistance.*
- *Student support services, such as local tutors or the provision of learning centres, are often more significant than the learning technology.*

(Mitchell & Bluer 1996, p.3)

relationships with teachers and trainers

The literature and commonsense indicate that students would generally prefer face-to-face contact with their teachers and trainers. Learning is a social as well as an intellectual activity and the extensive research into student reactions to distance education provision demonstrates the importance of 'contact'. Little or no face-to-face contact impacts on motivation, retention and student satisfaction with their own learning (Cope & Kalantzis 1998). The emerging focus on interactivity and communication using the technology can be seen as a form of compensatory contact predicated on the realisation that students as learners need contact, feedback, support and a sense of community if they are going to thrive (Palfreeman 1998). Whilst learning online is a novelty and has some intrinsic motivation that engages students, it can still be a medium as interminably boring as any other.

The significant difference lies in the quality and extent of communication that is facilitated by the technology and encouraged by the educational design of the learning materials. Communication facilitation online is a new area of teaching and training which needs a lot more research (Zorfass, Remz & Gold 1998).

student responsibilities

The assumption that the responsibility for learning lies with the student, trainee or participant is a difficult issue. The technology sometimes assumes that they have the motivation to apply themselves to the tasks; monitor their own learning and progress, and deal with the literacy/numeracy demands that are being made of them. A lot of students do not possess these courageous and wonderful characteristics, and our responsibility still remains with the unsupported (University of Illinois 1999).

access and control

Access is certainly one of the selling points of the new technologies. However, the creation of opportunities has to be enhanced by other forms of support (Alexander & McKenzie 1998; Palfreeman 1998). Similarly, the 'control' of the learner over the information and their own learning is proclaimed as being wonderful. However, this makes some presumptions about the nature of the learner, their skills and predispositions which may not be borne out in the hard light of day. The quantity of information which learners can access rather than impressing people with liberating powers simply represents another layer of threat to their own sense of themselves as learners (Ross & Schulz 1999).

findings and directions for further research

Not all the voices in the conversations about online delivery of education and training are full of the positivism and enthusiasm that spills out of the popular literature. There are critics of the role of education and training within the new environments:

The need for discussion of both the medium and the processes of education and training that are ostensibly taking place is critical.

> *Given the problems and difficulties that most schools have had in using computers over the past fifteen years, and given the questionable educational outcomes, it is remarkable that the computerisation and now the global networking of schools is so uncontroversial.* (Bigum & Kenway 1998)

The compulsive tendency to believe everything we see and read about technology as being authoritative and true is well documented (Froelich 1997; Kerka 1999). The participle-ridden claims expressed in advertising and popular government slogans and the blind faith we sometimes display towards technology ignore the fact that 'technological utopias quickly dissolve into educational, cultural and financial confusion and frustration and ... things gets worse before they get better—if they do' (Bigum & Kenway 1998).

Battersby (1999) analysed some of the effects on new technologies on continuing professional education (CPE):

> *Despite the seduction of virtual CPE in terms of its promises relating to access, equity and work-based learning, there is, surprisingly, an absence of informed debate about the concept, and more particularly, a lack of understanding about its long term implications.*

He cites the work of Gibson (1986), Marginson (1997), Nicoll (1997, 1998), Lukes (1974) and McWilliam and Taylor (1998) to list as critical issues the need for discussion of both the medium and the processes of education and training that are ostensibly taking place. He questions the extent to which the new technologies are

fostering 'self-fulfilment and reinforcement of a sense of purpose and identity and individual and group development'.

Authors have also discussed the extent to which the new media for the delivery of education and training embed the learning within the confines of a particular political and social construct. These constructs often seek to exert control and influence, and diminish the role of the facilitator/teacher. This is referred to as 'a lack of agency on the part of teachers, practitioners and instructors' (Bigum & Kenway 1998), and it is reinforced by the confusion of information and knowledge. The extent of power exercised by the medium itself is also discussed by Ted Clark (1997) who states that the new media are not necessarily neutral tools.

Yoni Ryan (1998) explores some of the equity issues associated with online support and delivery and Gladieux and Swail (1999) outline some key issues regarding virtual learning:

(1) educational/information technology tends to increase costs

(2) who will regulate a global learning market and how can employers evaluate credentials and

(3) virtual universities will help only those who have the necessary equipment and experience to be comfortable with the technologies, thus raising new barriers for those traditionally under represented in higher education

Online delivery of education and training can be contextualised within a global set of trends towards neoliberalism (McChesney in Chomsky 1999).

It is time to extend our questions. We certainly need to evaluate the effectiveness of our technological tools. But beyond this we need to question the kind of world we want to create through their use.

conclusion

tensions within **the literature**

The gaps between the often rhetorical claims of 'effectiveness', and the reality of well-researched studies are not often bridged.

When the 'pools' of literature and the multiple discourses are laid out, it is clear that the area is highly contested. The gaps between the often rhetorical claims of 'effectiveness', and the reality of well-researched studies are not often bridged. The degree to which the results of diligent and high-quality research percolate beyond their place of origin is questionable. It is almost as though we have groups of people working in this area who do not have the structures in place to exchange information and insights in a productive way (Brennan 2000). Dissemination of research results seems to be a serendipitous process. Access to these results is made more difficult for the average teacher/trainer by the exponential growth in the 'information' which is electronically available. When this set of circumstances is overlaid by the policy and commercial imperatives backed up by enthusiastic spending, the competing views about the use of online technologies force the discussions about effective implementation and evaluation even further underground. The literature of 'innovation' confirms:

- the need to identify and make explicit these tensions
- explain their assumptions
- provide scaffolds for further research and conversation

We seem to have generated more questions than answers.

The tensions identified in the literature include the following:

- Online delivery of VET creates learner isolation versus online delivery of VET creates a community of learners.
- Online delivery promotes a transformational view of learning versus the medium perpetuates a transmission view of learning.

- Online delivery is socially and politically liberating versus online delivery is an expression of cultural domination.
- The medium encourages choice of information and learner autonomy versus the medium strictly controls information and learning.
- Online delivery facilitates new and exciting modes of communication between learners and facilitators versus online delivery further isolates those already isolated by distance, ethnicity or socioeconomic circumstances.
- Online delivery facilitates the growth of learner independence versus online delivery encourages learner dependence.
- Online delivery regards the learner as a static vessel to be filled versus online delivery demands and encourages the learner to become an evolving and multidimensional individual with new skills and aptitudes.
- The site of online delivery establishes and builds a valuable learning culture versus online delivery is objective and disembodied.
- Online delivery focusses on the quality of the learning versus online delivery achieves quantifiable and sometimes narrow outcomes.
- Online delivery requires completely new ways of teaching and training versus online delivery requires small modifications to previous pedagogies.
- Online delivery can solve most education and training problems versus online delivery is restricted in its capacity to solve the major problems confronting education and training.
- Online delivery of education and training is engaging, intrinsically motivating and inclusive versus online delivery of education and training discriminates against certain kinds of learners and their backgrounds and leads to a disaffection with learning.
- Online delivery of education and training is predominantly a mass distributive activity versus online delivery of education and training is focussed on communication, collaboration and interactivity.
- Online delivery of education and training is a liberating opportunity for learning versus online delivery of education and training is characterised by low take-up rates.

directions for **new research**

The sets of tensions identified above represent the extremities of the debates which are being worked through at the moment. They can be explained in terms of the

views of education and training which the proponents hold; their political, administrative and employment contexts; and their capacities to access and integrate new knowledge in the area of online delivery of education and training. These tensions, and the assumptions on which they are based, provide the directions for new research in the VET sector. These directions are:

- an identification of the kinds of skills that are needed by learners using the online environment to ensure that outcomes are maximised and recommendations to make this happen
- an investigation of the attrition rates for students using online technologies; the reasons for these levels; the 'rescue strategies' which are in place and an evaluation of their effectiveness
- the forms of teacher/trainer preparation that are needed for teaching and training online
- a study of the kinds of student outcomes, both quantitative and qualitative, that online delivery of VET can produce
- an investigation of the structures that administrators of online delivery of VET need to develop to ensure effective delivery of VET using the new technologies
- a study of web pedagogies as they apply to the delivery of VET
- an extensive set of student evaluations of their experiences as participants in online delivery of VET
- a study of the ways in which different equity, social and cultural groups respond to online delivery of VET
- research into the effects on online delivery of VET on student learning styles
- a study of the most effective ways of disseminating information gained from research to practitioners
- research into the ways in which teacher/trainer collaboration and conversation can enhance the distribution and sharing of resources and technologies
- a study and project to make the results of research more publicly and readily available with a focus on easy applicability for practitioners
- a study of the emerging work patterns for practitioners using the new technologies for either delivery or support
- a study of the holistic approaches to online delivery of education and training which generate both best practice examples and principles for effective teaching and learning

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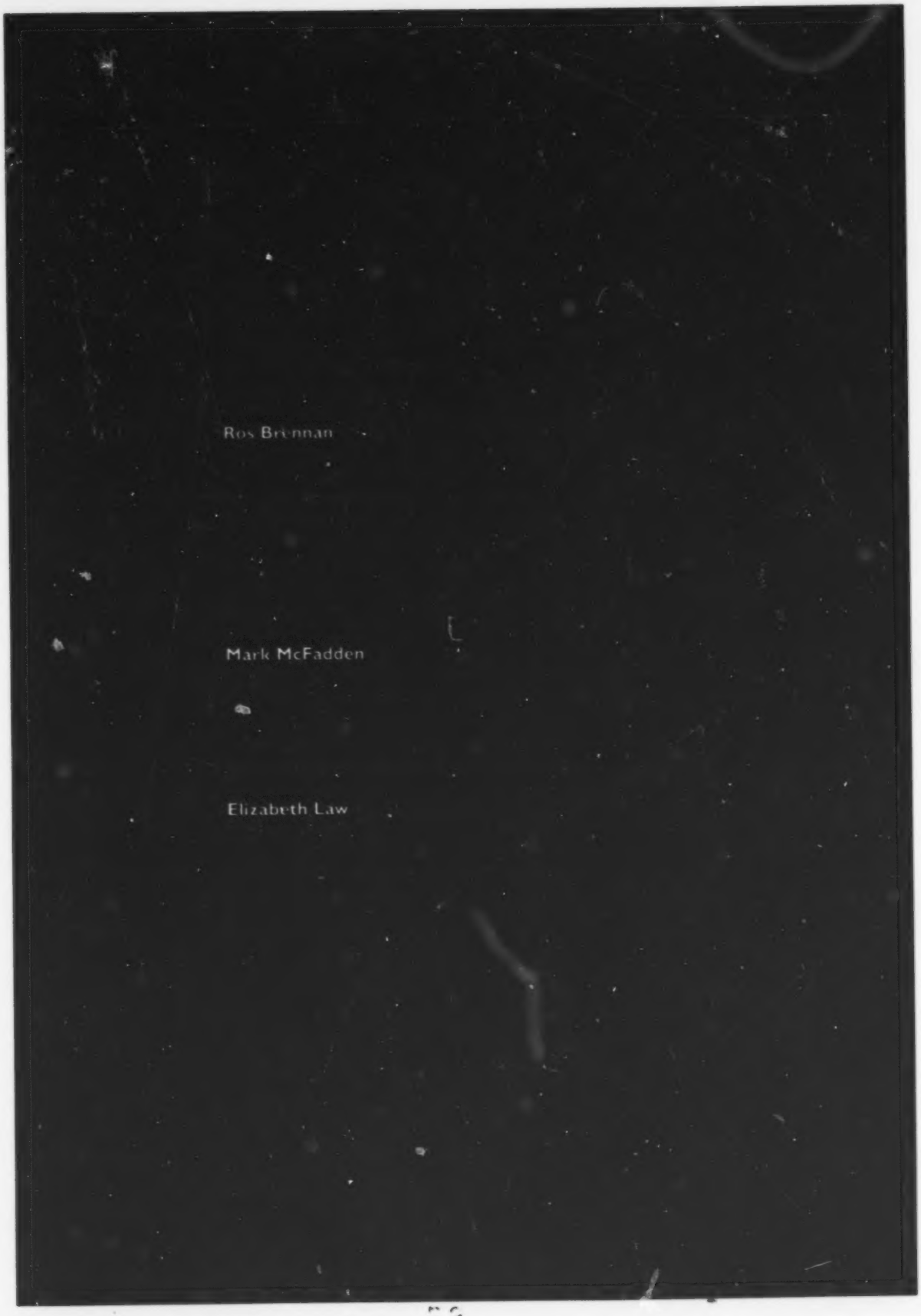

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